Data Sheet No. PD-2.030D

INTERNATIONAL RECTIFIER IOR

1N3879, 1N3889, 6FL, 12FL, 16FL SERIES

6A, 12A and 16A Fast Recovery Rectifiers

Major Ratings and Characteristics

		1N3879 –1N3883	1N3889 –1N3893	6FL...	12FL...	16FL...	Unit
$I_{F(AV)}$ †		6*	12*	6	12	16	A
I_{FSM}	50Hz	72	145	110	145	180	A
	60Hz	75*	150*	115	150	190	A
I^2t	50Hz	26	103	60	103	160	A^2s
	60Hz	23	94	55	94	150	A^2s
$I^2\sqrt{t}$		363	1452	855	1452	2290	$A^2\sqrt{s}$
t_{rr} range		see table					ns
V_{RRM} range		50 – 400*		50 – 1000			V
T_J range		–65 to 150					°C

*JEDEC registered values.

† At max. T_C = 100°C.

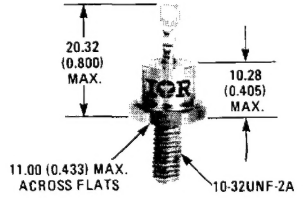
Description

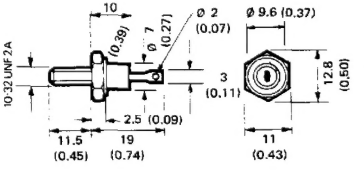
This range of fast recovery diodes is designed for applications in DC power supplies, inverters, converters, choppers, ultrasonic systems and for use as free wheel diodes.

Features

- Short reverse recovery time
- Low stored charge
- Wide current range
- Excellent surge capabilities
- *Standard JEDEC types*
- Stud cathode and stud anode versions
- Types up to 1000V V_{RRM}
- Fully characterised reverse recovery conditions

CASE STYLE AND DIMENSIONS





Conforms to JEDEC : DO–203AA (DO–4)
IEC 191–2 : A3U
BS 3934 : SO–10A
DIN 41885 : 101 C 2

All dimensions in millimetres (inches)

REVERSE VOLTAGE RATINGS

Part Number ① ④			V_{RRM} — Max. Repetitive Peak Reverse Voltage V	V_{RRM} — Max. Non-Repetitive Peak Reverse Voltage $t_p \leq 5$ ms V	I_R — Max. Reverse Current At Rated V_R $T_J = 25^oC$ mA	$T_J = 100^oC$ mA	$T_J = 150^oC$ mA	
	1N3879		50	75	0.015*	1.0*	3.0*	
	1N3880		100	150	0.015*	1.0*	3.0*	
	1N3881		200	250	0.015*	1.0*	3.0*	①
	1N3882		300	350	0.015*	1.0*	3.0*	
	1N3883		400	450	0.015*	1.0*	3.0*	
	1N3889		50	75	0.025*	3.0*	5.0*	
	1N3890		100	150	0.025*	3.0*	5.0*	
	1N3891		200	250	0.025*	3.0*	5.0*	①
	1N3892		300	350	0.025*	3.0*	5.0*	
	1N3893		400	450	0.025*	3.0*	5.0*	
**6FL5S02	6FL5S05	6FL5S10	50	75	0.050	—	6.0	
6FL10S02	6FL10S05	6FL10S10	100	150	0.050	—	6.0	
6FL20S02	6FL20S05	6FL20S10	200	275	0.050	—	6.0	
6FL40S02	6FL40S05	6FL40S10	400	500	0.050	—	6.0	④
6FL60S02	6FL60S05	6FL60S10	600	725	0.050	—	6.0	
—	6FL80S05	6FL80S10	800	950	0.050	—	6.0	
—	6FL100S05	6FL100S10	1000	1250	0.050	—	6.0	
**12FL5S02	12FL5S05	12FL5S10	50	75	0.050	—	6.0	
12FL10S02	12FL10S05	12FL10S10	100	150	0.050	—	6.0	
12FL20S02	12FL20S05	12FL20S10	200	275	0.050	—	6.0	
12FL40S02	12FL40S05	12FL40S10	400	500	0.050	—	6.0	④
12FL60S02	12FL60S05	12FL60S10	600	725	0.050	—	6.0	
—	12FL80S05	12FL80S10	800	950	0.050	—	6.0	
—	12FL100S05	12FL100S10	1000	1250	0.050	—	6.0	
**16FL5S02	16FL5S05	16FL5S10	50	75	0.050	—	6.0	
16FL10S02	16FL10S05	16FL10S10	100	150	0.050	—	6.0	
16FL20S02	16FL20S05	16FL20S10	200	275	0.050	—	6.0	
16FL40S02	16FL40S05	16FL40S10	400	500	0.050	—	6.0	④
16FL60S02	16FL60S05	16FL60S10	600	725	0.050	—	6.0	
—	16FL80S05	16FL80S10	800	950	0.050	—	6.0	
—	16FL100S05	16FL100S10	1000	1250	0.050	—	6.0	

REVERSE RECOVERY CHARACTERISTICS

		1N3879–1N3883	1N3889–1N3893	6FL... S02	6FL... S05	6FL... S10	12FL... S02	12FL... S05	12FL... S10	16FL... S02	16FL... S05	16FL... S10	Unit	Conditions
t_{rr}	Max. reverse recovery time	150	150	110	285	490	100	250	430	90	225	390	ns	$T_J = 25^oC$, $I_F = 1A$ to $V_R = 30V$, $dI_{F/dt} = 100\ A/\mu s$
		300*	300*	200	500	1000	200	500	1000	200	500	1000	ns	$T_J = 25^oC$, $dI_{F/dt} = 25\ A/\mu s$, $I_{FM} = \pi \times$ rated $I_{F(AV)}$
$I_{RM(REC)}$	Max. peak recovery current	4*	5*	—	—	—	—	—	—	—	—	—	—	
Q_{RR}	Max. reverse recovered charge	400	350	230	1700	5000	200	1300	3800	150	1100	3000	nC	$T_J = 25^oC$, $I_F = 1A$ to $V_R = 30V$, $dI_{F/dt} = 100\ A/\mu s$
		400	400	200	1200	5000	200	1200	5000	200	1200	5000	nC	$T_J = 25^oC$, $dI_{F/dt} = 25\ A/\mu s$, $I_{FM} = \pi \times$ rated $I_{F(AV)}$

ELECTRICAL SPECIFICATIONS

		1N3879–1N3883	6FL...	1N3889–1N3893 12FL...	16FL...	Unit	Conditions	
	FORWARD CONDUCTION							
$I_{F(AV)}$	Max. average forward current	6*	6	12*	16	A	180° conduction, half sine wave, $T_C = 100^oC$	
$I_{F(RMS)}$	Max. r.m.s. forward current	9.5	9.5	19	25	A		
I_{FSM}	Max. peak one-cycle non-repetitive forward current	72	110	145	180	A	t = 10 ms, With rated V_{RRM}	Sinusoidal half wave, initial $T_J = 150^oC$
		75*	115	150*	190		t = 8.3 ms, With rated V_{RRM}	
		85	130	170	215		t = 10 ms, $V_{RRM} = 0$	
		90	135	180	225		t = 8.3 ms, $V_{RRM} = 0$	
I^2t	Max. I^2t for fusing	26	60	103	160	A^2s	t = 10 ms, With rated V_{RRM}	Initial $T_J = 150^oC$
		23	55	94	150		t = 8.3 ms, With rated V_{RRM}	
	Max. I^2t for individual device fusing	36	86	145	230		t = 10 ms, $V_{RRM} = 0$	
		33	78	130	210		t = 8.3 ms, $V_{RRM} = 0$	
$I^2\sqrt{t}$	Max. $I^2\sqrt{t}$ for individual device fusing ⑤	363	856	1452	2290	$I^2\sqrt{s}$	t = 0.1 to 10 ms	
V_{FM}	Max. peak forward voltage	1.4*	1.4	1.4*	1.4	V	$T_J = 25^oC$, I_F = rated $I_{F(AV)}$ (D.C.)	
		1.5*	1.5	1.5*	1.5		$T_C = 100^oC$, $I_{FM} = \pi \times$ rated $I_{F(AV)}$	

*JEDEC registered value

**Suffix "S02" may be omitted, i.e., 12FL10 implies 12FL10S02, 12FLR60 implies 12FLR60S02.

① Types listed are cathode to case; for anode-to-case include "R" in code, i.e., 1N3879R, 6FLR20S10, 16FLR40S02.

② $I_{R(AV)}$ @ rated $I_{F(AV)}$ and V_{RRM}, and $T_C = 100^oC$.

③ I_{RM} @ rated V_{RRM} and $T_J = 150^oC$.

⑤ I^2t for time $t_x = I^2\sqrt{t} \cdot \sqrt{x}$

⑥ When these devices are ordered without a suffix, e.g., 40HFL, the order will be filled with devices that meet the S02 specification.

Thermal and mechanical specifications

			1N3879 –1N3883 6FL...	1N3889 –1N3893 12FL...	16FL...	Units	Conditions
T_J	Junction operating temperature range		–65 to 150			°C	
T_{stg}	Storage temperature range		–65 to 175			°C	
R_{thJC}	Maximum internal thermal resistance, junction to case		2.5	2.0	1.6	deg C/W	DC operation
R_{thCS}	Maximum thermal resistance, case to heatsink		0.5			deg C/W	Mounting surface flat, smooth and greased.
T	Mounting torque ±.10%	to nut	10.5			lbf.in	Lubricated threads (Non-lubricated threads)
			0.12			kgf.m	
			1.2			Nm	
		to device	11.5 (13.5)			lbf.in	
			0.13 (0.155)			kgf.m	
			1.3 (1.35)			Nm	
wt	Approximate weight		7			g	
			0.25			oz	
	Case style		DO–203AA (DO–4)				JEDEC

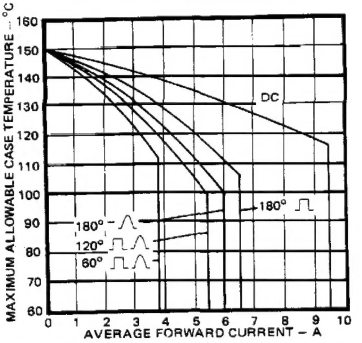


Fig. 1 – Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3879 and 6FL Series

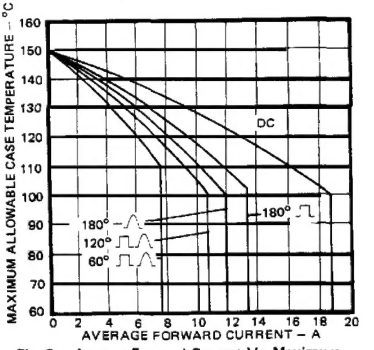


Fig. 2 – Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3889 and 12FL Series

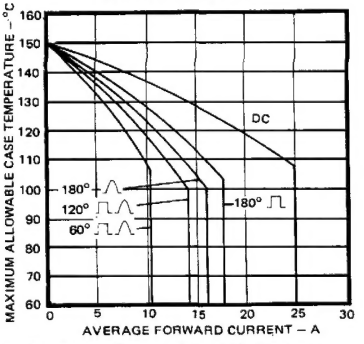
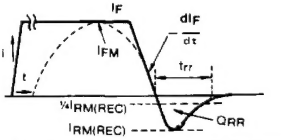


Fig. 3 – Average Forward Current Vs. Maximum Allowable Case Temperature, 16FL Series



I_F, I_{FM} = Peak forward current prior to commutation

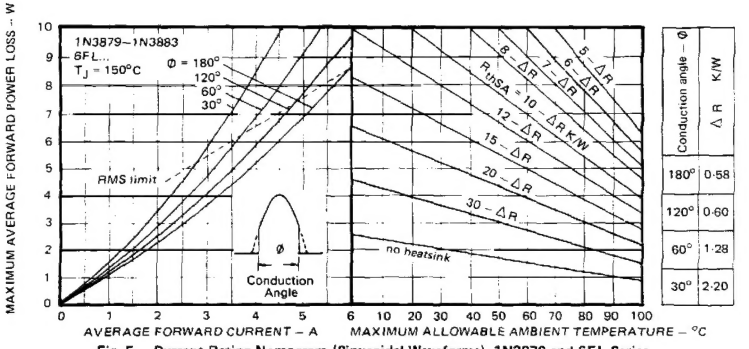
$-dI_F/dt$ = Rate of fall of forward current

$I_{RM(REC)}$ = Peak reverse recovery current

t_{rr} = Reverse recovery time

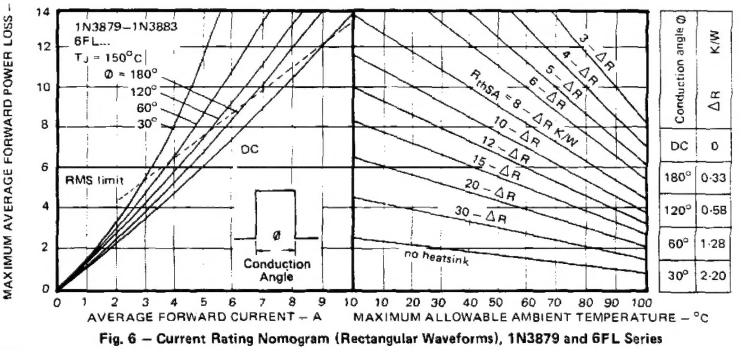
Q_{RR} = Reverse recovered charge

Fig. 4 – Reverse Recovery Time Test Waveform



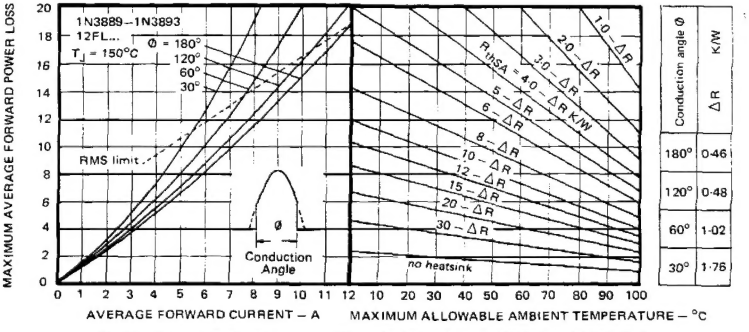
Conduction angle – Ø	ΔR K/W
180°	0·58
120°	0·60
60°	1·28
30°	2·20

Fig. 5 – Current Rating Nomogram (Sinusoidal Waveforms), 1N3879 and 6FL Series



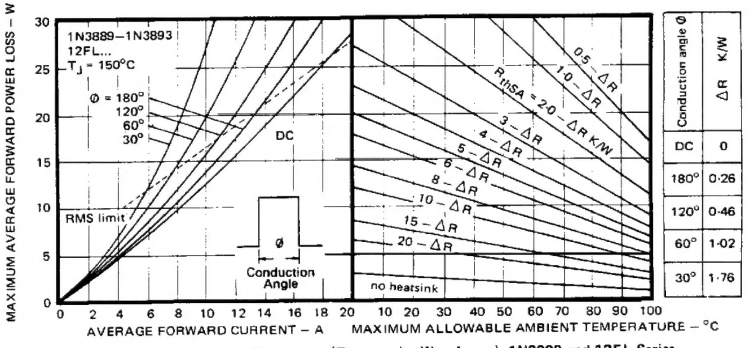
Conduction angle Ø	ΔR K/W
DC	0
180°	0·33
120°	0·58
60°	1·28
30°	2·20

Fig. 6 – Current Rating Nomogram (Rectangular Waveforms), 1N3879 and 6FL Series



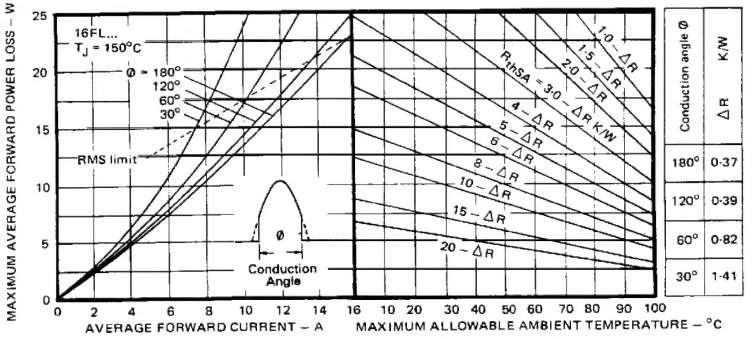
Conduction angle Ø	ΔR K/W
180°	0·46
120°	0·48
60°	1·02
30°	1·76

Fig. 7 – Current Rating Nomogram (Sinusoidal Waveforms), 1N3889 and 12FL Series



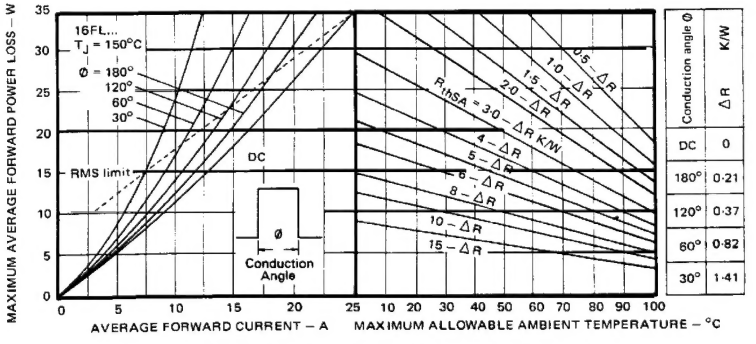
Conduction angle Ø	K/W ΔR
DC	0
180°	0·26
120°	0·46
60°	1·02
30°	1·76

Fig. 8 – Current Rating Nomogram (Rectangular Waveforms), 1N3889 and 12FL Series



Conduction angle Ø	K/W ΔR
180°	0·37
120°	0·39
60°	0·82
30°	1·41

Fig. 9 – Current Rating Nomogram (Sinusoidal Waveforms), 16FL Series



Conduction angle Ø	K/W ΔR
DC	0
180°	0·21
120°	0·37
60°	0·82
30°	1·41

Fig. 10 – Current Rating Nomogram (Rectangular Waveforms), 16FL Series

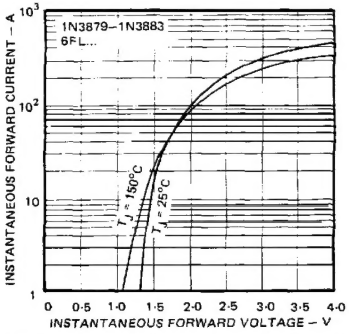


Fig. 11 – Maximum Forward Voltage Vs. Forward Current, 1N3879 and 6FL Series

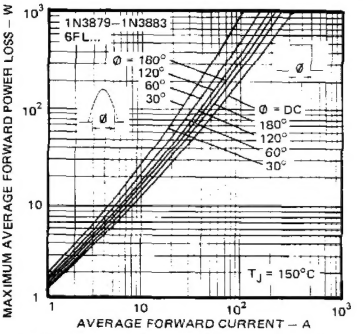


Fig. 12 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3879 and 6FL Series

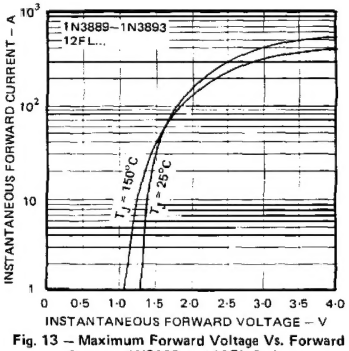


Fig. 13 – Maximum Forward Voltage Vs. Forward Current, 1N3889 and 12FL Series

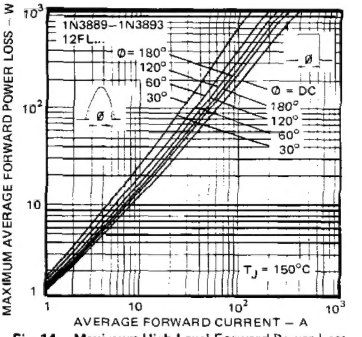


Fig. 14 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3889 and 12FL Series

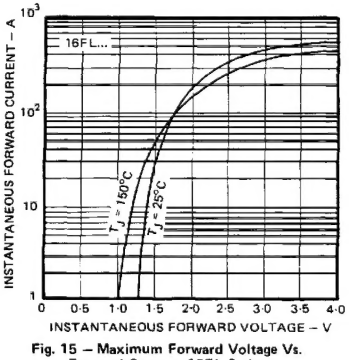


Fig. 15 – Maximum Forward Voltage Vs. Forward Current, 16FL Series

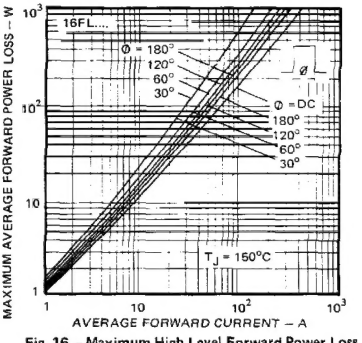


Fig. 16 – Maximum High Level Forward Power Loss Vs. Average Forward Current, 16FL Series

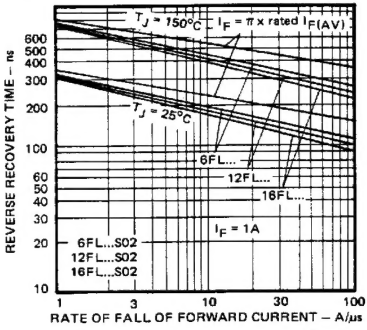


Fig. 17A – Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series __S02

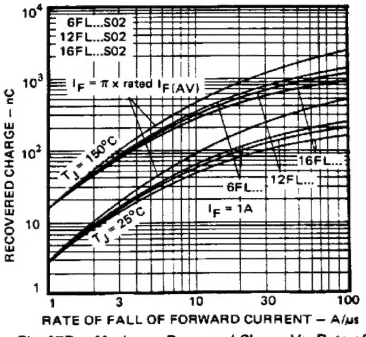


Fig. 17B – Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series __S02

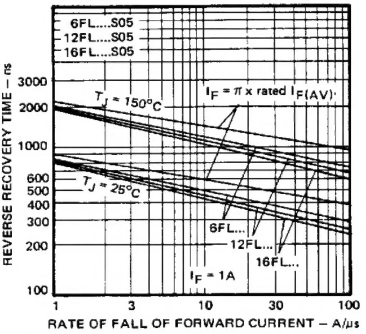


Fig. 18A – Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series __S05

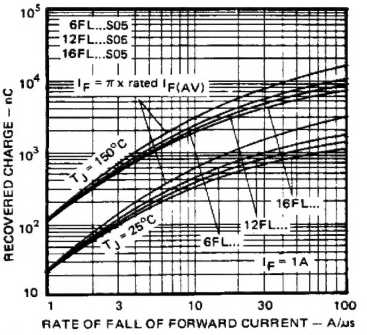


Fig. 18B – Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series __S05

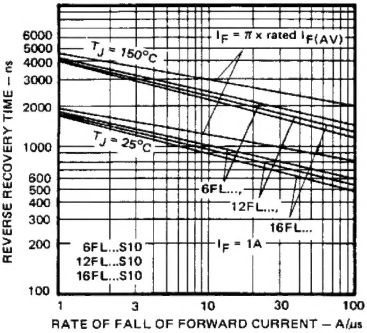


Fig. 19A – Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series __S10

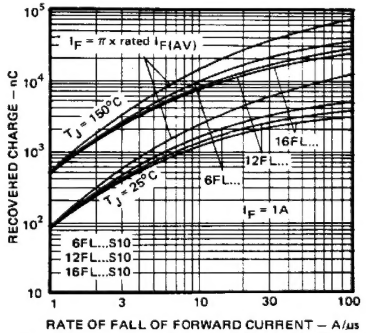


Fig. 19B – Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series __S10

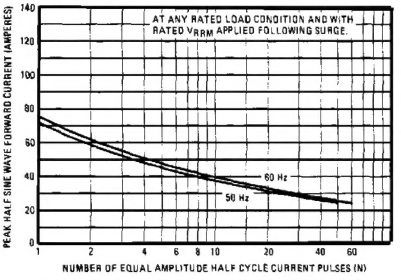


Fig. 20 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3879 Series

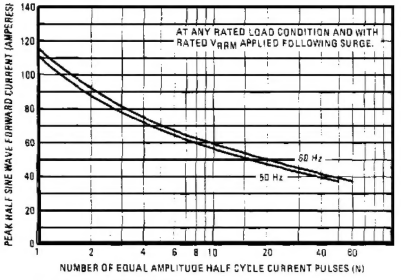


Fig. 21 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 6FL Series

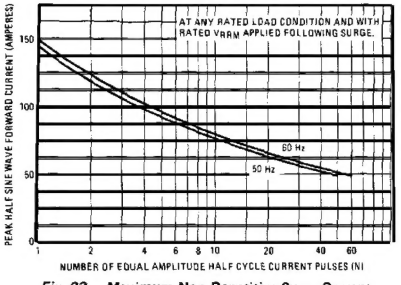


Fig. 22 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3889 and 12FL Series

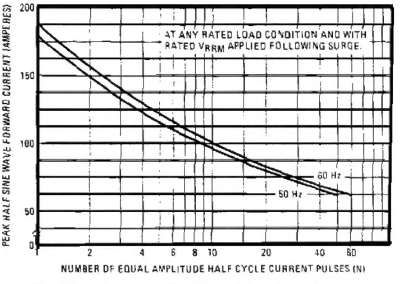


Fig. 23 – Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 16FL Series

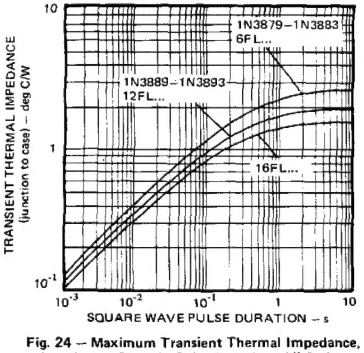


Fig. 24 – Maximum Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration, *All* Series.